REMARKS

Independent claims 1 and 6 have each been further amended to more particularly point out and more distinctly claim the subject matter that the applicants regard as their invention. As so amended, each of those claims recites that the SiO_2 replaces bentonite clay in molybdenum silicide heating element compositions containing bentonite clay. Each of those claims has also been amended to recite that the heating element serves to prevent heating oven contamination in the form of peeled heating element oxide layer particles resulting from thermal cycling of the heating element between room temperature and about 1500 °C.

The previously-existing claims were rejected as failing to comply with the written description requirement. Reference was made to page 5, paragraph 24 of the specification in which only "an oxide" was mentioned, and it was concluded that an Al_2O_3 protective layer had hot been disclosed. In that regard, the term "protective" has been deleted from each of claims 1 and 6. Moreover, the specification refers at several places to Al_2O_3 and to an aluminum oxide layer. See, e.g., paragraph [0004], line 2; paragraph [0007], lines 2 and 3; paragraph [0012], line 8; paragraph [0014], line 2; and paragraph [0017], line 4. And the previously-existing problem of peeling of an Al_2O_3 oxide surface (see paragraph [0014]) is solved by the present invention (see paragraph [0016]). From all those mentions of Al_2O_3 and of an aluminum oxide layer one of ordinary skill in the art, who is the person to whom patent specifications are directed (see 35 U.S.C. §112, first paragraph), would clearly

recognize that the oxide referred to in paragraph [0024] is Al_2O_3, because it is the prevention of peeling of that oxide layer that is the problem to which the invention is directed, as noted earlier in the specification. Accordingly, it is respectfully urged that the specification and claims comply with the written description requirement.

Claims 6 and 8-11 were rejected as indefinite because of the use of the term "type." In that regard, that term has been deleted from each of claims 1 and 6, thereby overcoming the alleged indefiniteness.

Claims 1, 4 through 6, 8 and 9 were rejected as obvious based upon a combination of the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 reference. With respect to Schrewelius '145, the examiner acknowledged that that reference did not disclose either the production of Al_2O_3 or that the SiO_2 that is present is at least 98% pure. However, and very significantly, the Schrewelius '145 reference also does not disclose the claimed molybdenum aluminum silicide material. Instead, in reciting the thermocouple composition in the form $(Mo_{1-y}\ M_y)\ (Si_{1-x}\ Al_x)_2$ it identifies the metal M as one or more of "Ti, Zr, Hf, Ta, Nb, V, W or Cr." (See Schrewelius '145, col. 1, lines 69-70). And in the only example provided in that reference, it discloses an alloy having a considerably different composition, namely $(Mo_{0.7}Ti_{0.3})(Si_{0.8}Al_{0.2})$. It does not disclose molybdenum aluminum silicide mixed in combination with SiO_2 having at least 98% purity. It also does not indicate any recognition of a peeling Al_2O_3 layer when subjected to thermal cycling, nor does it even mention thermal cycling of heating elements.

Additionally, and also very significantly, it teaches the use of bentonite for both the positive leg of the thermocouple (see Schrewelius '145, col. 3, line 3) as well as for the negative leg of the thermocouple (see Schrewelius '145, col. 3, line 15). The SiO_2 content of bentonite is of the order of about 60-70% (see paragraph [0011] of the present application), which is considerably lower than the 98% purity recited in each of clams 1 and 6. Moreover, the present invention teaches in paragraph [0022] of the specification to substitute silicon dioxide for bentonite to avoid the impurities that are contained in bentonite. Thus, the Schrewelius '145 reference teaches away from the present invention by leading one having only ordinary skill in the art to use bentonite in a heating element composition, not 98% pure SiO_2 as claimed herein, and not to use molybdenum aluminum silicide, also as claimed herein.

The Schrewelius '959 reference was cited for disclosing a molybdenum silicide heating element in which Al_2O_3 is formed. However, there is no disclosure in that reference of an outer surface layer of Al_2O_3. Instead, the Al_2O_3 is disclosed merely as a constituent that reacts with SiO_2 to stop grain growth of the silicate. Although that reference mentions Al_2O_3, it does so only in the context of a constituent that reacts with SiO_2 to form a glass phase. Importantly, that reference does not disclose or even suggest an Al_2O_3 surface layer. Instead, it repeatedly refers to an outer surface layer of quartz glass (see, e.g., Schrewelius '959 at col. 1, lines 20-23; col. 2, lines 41-50 and lines 67-71; col. 3, lines 1-2; col. 4, line 38; col. 5, lines 44-48; and col. 8, lines 70-71). The quartz glass outer layer serves to limit high temperature oxidation

(see Schrewelius '959 at col. 2, lines 48-50) and stops grain growth (see Schrewelius '959, col. 6, lines 5-7).

Moreover, the composition disclosed at the bottom of column 5 of the Schrewelius '959 reference identifies the types of impurities that are included in bentonite clay. That clearly suggests that bentonite clay is a constituent in the Schrewelius '959 composition, a constituent that the inventors have discovered leads to a peelable outer oxide layer. That oxide layer peeling problem is overcome in the present invention by providing in the heating element composition SiO_2 of at least 98% purity. Finally, the Schrewelius '959 reference also does not indicate any recognition of the problem of a peeling Al_2O_3 outer layer when a heating element is subjected to thermal cycling, and therefore it does not teach or even remotely suggest a solution to that problem.

The Sekhar et al. '399 reference was cited for disclosing pure SiO_2 in the context of an electrical heating element. But that reference relates to different materials and different compositions. In fact, there is no mention at all in that reference of the major constituent in the composition of the claimed invention, which is $Mo(Si_{1-x}\ Al_x)_2$. It also does not indicate any recognition of a peeling Al_2O_3 layer when a heating element is subjected to thermal cycling. Instead, the Sekhar et al. '399 reference is directed to a different problem, that of providing oxidation resistance (see Sekhar et al. '399, col. 1, lines 39-44).

In addition to the differences in materials and in the differences in the problems to which the individual references are directed, there are no disclosures in any of the references relied upon that would motivate one having

only ordinary skill in the art to combine them in any way at all, let alone to arrive at the claimed invention. Because the problem addressed by the present invention is not mentioned in the references and is different from the problems to which the references are addressed, one of only ordinary skill in the art would not be led to those references for a solution to the problem of the peeling of an Al_2O_3 outer surface layer of a heating element that is subjected to thermal cycling between room temperature and 1500°C.

Additionally, even if one of only ordinary skill in the art were to consider the references relied upon, is not apparent from the references just which parts of which reference should be combined with which parts of the other references and which parts of the references should be ignored or discarded. Indeed, it appears that the only motivation for even selecting the references, and then combining them in a particular way is the present disclosure. But it is improper to use as a road map or a template an inventor's disclosure in order to use against him that which only he has disclosed.

Each of independent claims 1 and 6 clearly recites an Al_2O_3 surface layer that does not peel under thermal cycling between room temperature and about 1500°C. None of the references relied upon discloses or suggests an Al_2O_3 surface layer, nor do any of the references even mention or appreciate the peeling problem to which the present invention is directed. Thus, whether the references are considered alone or together, neither the individual references nor any attempted combination of them teaches or suggests the invention as it is claimed in either of claims 1 and 6.

Additionally, as hereinabove amended each of independent claims 1 and 6 now recites that the SiO_2 replaces bentonite clay in molybdenum silicide heating element compositions containing bentonite clay. None of the references individually or collectively teaches or suggests such a substitution. And amended claims 1 and 6 also each recite the prevention of heating oven contamination by peeled heating element oxide layer particles. The invention as now claimed in amended claims 1 and 6 is thus structurally and functionally distinguishable over the disclosures contained in the references relied upon. And it should also be noted that functional recitations must be considered and given full weight in a patentability analysis. In that regard, the Board of Patent Appeals has said the following concerning functional language in a claim:

> Although we have sustained several of the Examiner's rejections we here wish to specifically note that contrary to the Examiner's assertions, functional language in the claims must be given full weight and may not be disregarded in evaluating the patentability of the subject matter defined employing such functional language. However, the applicant must establish that what is taught by the reference does not inherently function in the same manner required by the claim; cf. In re Hallman decided by the CCPA July 16, 1981, 655 F.2d 212, 210 U.S.P.Q. 609.

Ex parte Bylund, 217 U.S.P.Q. 492, 498 (Bd. App. 1981).

And the Federal Circuit has spoken similarly regarding functional language. *K2 Corp. v. Salomon S.A.,* 52 U.S.P.Q.2d 1001, 1004 (Fed. Cir. 1999) ("The

functional language is, of course, an additional limitation in the claim."). And as has been pointed out above, none of the references appreciates either the peeling problem or its solution as herein claimed.

Claims 4 through 6, 8, and 9 each depend from one of amended claim 1 or amended claim 6, either directly or indirectly, and therefore the same distinctions as are noted above in connection with claims 1 and 6 apply with equal effect to those respective dependent claims. Further, the dependent claims contain additional recitations that further distinguish the invention as so claimed from the teachings of the references relied upon.

Claims 2 and 10 were rejected as obvious based upon the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 reference, and in view of the Chyung et al. '091 reference. The Chyung et al. '091 reference was cited merely for a disclosure of mullite. However, the Chyung et al. '091 reference also lacks those features recited in amended independent claims 1 and 6 that are noted in the discussion above relative to the other references that were relied upon. Accordingly, the addition of that reference to the combination asserted in connection with claim 1 still does not teach or suggest the invention as claimed in amended claim 1, from which each of claims 2 and 10 depend. Again, however, there are no disclosures in any of the references relied upon that would lead one having only ordinary skill in the art to combine them in any way at all, let alone to arrive at the claimed invention. And it is not apparent from the references just which parts of which reference should be combined with which parts of the other references and

which parts of the references should be ignored or discarded. Indeed, it appears that the only motivation for even selecting the references and then combining them in a particular way is the present disclosure. But it is improper to use as a road map or a template an inventor's disclosure in order to use against him that which only he has disclosed.

Claim 11 was rejected as obvious based upon the combination of the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 and the Chyung et al. '091 references, in view of the Sawamura et al. '215 reference. The Sawamura et al. '215 reference was cited for disclosing sillimanite. But that reference also lacks the teaching or suggestion of the factors discussed above in connection with the other references. Therefore, even if the Sawamura et al. '215 reference were to be combined with the other references relied upon, that combination still does not teach or suggest the invention as claimed in claim 1, from which claim 11 indirectly depends.

Based upon the foregoing amendments and remarks, the claims as they now stand in the application are believed clearly to be in allowable form in that they patentably distinguish over the disclosures contained in the references that were cited and relied upon by the examiner, whether those references be considered alone or together. Consequently, this application is believed now to be in condition for allowance, and reconsideration and reexamination of the application is respectfully requested with a view toward the issuance of a Notice of Allowance.

The courtesy of an interview is requested if this amendment is not deemed to place the present application in condition for allowance. In that event, the examiner is invited to telephone the undersigned to arrange a convenient time for such an interview.

Respectfully submitted,

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